Swansea University
Prifysgol Abertawe

FACULTY OF SCIENCE AND ENGINEERING

UNDERGRADUATE TAUGHT STUDENT HANDBOOK

YEAR 2 (FHEQ LEVEL 5)

CIVIL ENGINEERING DEGREE PROGRAMMES

SUBJECT SPECIFIC
PART TWO OF TWO
MODULE AND COURSE STRUCTURE
2023-24

DISCLAIMER

The Faculty of Science and Engineering has made all reasonable efforts to ensure that the information contained within this publication is accurate and up-to-date when published but can accept no responsibility for any errors or omissions.

The Faculty of Science and Engineering reserves the right to revise, alter or discontinue degree programmes or modules and to amend regulations and procedures at any time, but every effort will be made to notify interested parties.

It should be noted that not every module listed in this handbook may be available every year, and changes may be made to the details of the modules. You are advised to contact the Faculty of Science and Engineering directly if you require further information.

The 23-24 academic year begins on 25 September 2023

Full term dates can be found here

DATES OF 23-24 TERMS

25 September 2023 – 15 December 2023

8 January 2024 – 22 March 2024

15 April 2024 – 07 June 2024

SEMESTER 1

25 September 2023 – 29 January 2024

SEMESTER 2

29 January 2024 – 07 June 2024

SUMMER

10 June 2024 – 20 September 2024

IMPORTANT

Swansea University and the Faculty of Science of Engineering takes any form of **academic misconduct** very seriously. In order to maintain academic integrity and ensure that the quality of an Award from Swansea University is not diminished, it is important to ensure that all students are judged on their ability. No student should have an unfair advantage over another as a result of academic misconduct - whether this is in the form of **Plagiarism**, **Collusion** or **Commissioning**.

It is important that you are aware of the **guidelines** governing Academic Misconduct within the University/Faculty of Science and Engineering and the possible implications. The Faculty of Science and Engineering will not take intent into consideration and in relation to an allegation of academic misconduct - there can be no defence that the offence was committed unintentionally or accidentally.

Please ensure that you read the University webpages covering the topic – procedural guidance here and further information here. You should also read the Faculty Part One handbook fully, in particular the pages that concern Academic Misconduct/Academic Integrity.

Welcome to the Faculty of Science and Engineering!

Whether you are a new or a returning student, we could not be happier to be on this journey with you.

At Swansea University and in the Faculty of Science and Engineering, we believe in working in partnership with students. We work hard to break down barriers and value the contribution of everyone.

Our goal is an inclusive community where everyone is respected, and everyone's contributions are valued. Always feel free to talk to academic, technical and administrative staff, administrators - I'm sure you will find many friendly helping hands ready to assist you. And make the most of living and working alongside your fellow students.

During your time with us, please learn, create, collaborate, and most of all – enjoy yourself!

Professor David Smith
Pro-Vice-Chancellor and Executive Dean
Faculty of Science and Engineering

Faculty of Science and Engineering	
Pro-Vice-Chancellor and Executive Dean	Professor David Smith
Director of Faculty Operations	Mrs Ruth Bunting
Associate Dean – Student Learning and Experience (SLE)	Professor Laura Roberts
School of Aerospace, Civil, Electrical, General and Mechanical Engineering	
Head of School	Professor Antonio Gil
School Education Lead	Professor Cris Arnold
Head of Civil Engineering	Professor Eduardo De Souza Neto
Civil Engineering Programme Director	Dr Clare Wood
Year Coordinators	Dr Yunqing Xuan

STUDENT SUPPORT

The Faculty of Science and Engineering has two **Reception** areas - Engineering Central (Bay Campus) and Wallace 223c (Singleton Park Campus).

Standard Reception opening hours are Monday-Friday 8.30am-4pm.

The **Student Support Team** provides dedicated and professional support to all students in the Faculty of Science and Engineering. Should you require assistance, have any questions, be unsure what to do or are experiencing difficulties with your studies or in your personal life, our team can offer direct help and advice, plus signpost you to further sources of support within the University. There are lots of ways to get information and contact the team:

Email: studentsupport-scienceengineering@swansea.ac.uk (Monday–Friday, 9am–5pm)

Call: +44 (0) 1792 295514 (Monday-Friday, 10am–12pm, 2–4pm).

Zoom: By appointment. Students can email, and if appropriate we will share a link to our Zoom calendar for students to select a date/time to meet.

The current student **webpages** also contain useful information and links to other resources:

https://myuni.swansea.ac.uk/fse/

READING LISTS

Reading lists for each module are available on the course Canvas page and are also accessible via http://ifindreading.swan.ac.uk/. We've removed reading lists from the 23-24 handbooks to ensure that you have access to the most up-to-date versions.
We do not expect you to purchase textbooks, unless it is a specified key text for the course.

THE DIFFERENCE BETWEEN COMPULSORY AND CORE MODULES

Compulsory modules must be **pursued** by a student.

Core modules must not only be **pursued**, but also **passed** before a student can proceed to the next level of study or qualify for an award. Failures in core modules must be redeemed.

Further information can be found under "Modular Terminology" on the following link - https://myuni.swansea.ac.uk/academic-life/academic-regulations/taught-guidance/essential-info-taught-students/your-programme-explained/

Year 2 (FHEQ Level 5) 2023/24
Civil Engineering

BEng Civil Engineering[H200,H205]
BEng Civil Engineering with a Year Abroad[H206]
MEng Civil Engineering[H201]
MEng Civil Engineering with a Year Abroad[H207]

Semester 1 Modules	Semester 2 Modules
EG-219 **Statistical Methods in Engineering** **10 Credits** **Miss CM Barnes/Prof L Li/Prof P Rees/Dr Y Xuan** **CORE**	**EG-201** **Fluid Mechanics II** **10 Credits** **Dr J Li/Prof DE Reeve** **CORE**
EG-221 **Structural Mechanics 2** **10 Credits** **Prof O Hassan** **CORE**	**EG-235** **Dynamics 1 (Med & Civil)** **10 Credits** **Dr H Madinei** **CORE**
EG-228 **Problem Solving in Engineering with Matlab** **10 Credits** **Prof R Sevilla** **CORE**	**EG-295** **Introduction to Transportation Engineering** **10 Credits** **Dr Y Hou** **CORE**
EG-234 **Civil Engineering Management** **10 Credits** **Dr CAC Wood/Miss X Yin** **CORE**	
EG-2000 **Geomechanics I** **20 Credits** **Dr J Clancy/Dr KJ Ficken/Dr J Hiemstra** **CORE**	
EG-258 **Civil Engineering Design and Practice 1** **30 Credits** **Dr CAC Wood/Miss X Yin** **CORE**	
EG-277 **Research Project Preparation** **0 Credits** **Dr AC Tappenden/Dr M Fazeli/Mrs KM Thomas**	
Total 120 Credits	

Year 2 (FHEQ Level 5) 2023/24
Civil Engineering
BEng Civil Engineering with a Year in Industry[H202]
MEng Civil Engineering with a Year in Industry[H204]

Semester 1 Modules	Semester 2 Modules
EG-219 **Statistical Methods in Engineering** **10 Credits** **Miss CM Barnes/Prof L Li/Prof P Rees/Dr Y Xuan** **CORE**	**EG-201** **Fluid Mechanics II** **10 Credits** **Dr J Li/Prof DE Reeve** **CORE**
EG-221 **Structural Mechanics 2** **10 Credits** **Prof O Hassan** **CORE**	**EG-235** **Dynamics 1 (Med & Civil)** **10 Credits** **Dr H Madinei** **CORE**
EG-228 **Problem Solving in Engineering with Matlab** **10 Credits** **Prof R Sevilla** **CORE**	**EG-295** **Introduction to Transportation Engineering** **10 Credits** **Dr Y Hou** **CORE**
EG-234 **Civil Engineering Management** **10 Credits** **Dr CAC Wood/Miss X Yin** **CORE**	
EG-2000 **Geomechanics I** **20 Credits** **Dr J Clancy/Dr KJ Ficken/Dr J Hiemstra** **CORE**	
EG-233 **Placement Preparation: Engineering Industrial Year** **0 Credits** **Prof GTM Bunting/Dr SA Rolland/Dr V Samaras**	
EG-258 **Civil Engineering Design and Practice 1** **30 Credits** **Dr CAC Wood/Miss X Yin** **CORE**	
EG-277 **Research Project Preparation** **0 Credits** **Dr AC Tappenden/Dr M Fazeli/Mrs KM Thomas**	
Total 120 Credits	

EG-2000 Geomechanics I

Credits: 20 Session: 2023/24 Academic Year

Pre-requisite Modules: EG-113; EG-115; EG-120; EG-166

Co-requisite Modules:

Lecturer(s): Dr J Clancy, Dr KJ Ficken, Dr J Hiemstra

Format: Lectures/Example Classes: 2/3 hours per week. Practical element: 10 hours approximately. Directed private study 2 hours per week

Delivery Method: The module is delivered by lectures and example classes.
Communication and course announcements, including office hours details, will be made via Canvas.
Course materials, including the course notes, will be available for download from Canvas.
Lecture recording and screencasts may be employed to aid understanding.
In-class demonstrations of certain soil mechanics/geology aspects when feasible.

Module Aims: Geomechanics is the study of the mechanical behaviour of geological material, namely rocks and soils. The understanding of these concepts is crucial owing to the importance of these materials in the stability of supported structures. This 20 credit module, spanning both TB1 and TB2, introduces the fundamental theory associated with the mechanical properties of both forms of geological material. On completion of this module, the student will be prepared to look at further advanced topics in Geomechanics II.

Module Content: Geology:
1. Introduction to geology
2. Geological Materials
3. Surface Processes and Superficial Deposits
4. Deformation of Rocks
5. Geology Site Investigations and Engineering Geology

Soils:
1. Origin of soils,
2. Soil classification, British Soil Classification System, particle size distribution, specific gravity measurements, moisture content, void ratio, porosity and relationship between various measures,
3. Compaction, optimum moisture content, field compaction methods.
4. Permeability and its determination, constant head and variable head permeability tests, determination of permeability from field tests.
5. Seepage theory, seepage flow through soils, total head, piezometric head and pore pressure, flow nets, flow-net construction, seepage forces, quick sand conditions.
6. Terzaghi's principle of effective stress, effective vertical stress due to self-weight of the soil, change in effective stress due to change in total stress, drained and undrained conditions, influence of rise and fall of water table, influence of capillary rise, influence of seepage flow-induced pore pressure changes, consolidation theory, settlement calculations, oedometer tests.
7. Introduction to shear strength of soils, Mohr-Coulomb failure criterion, drained and undrained strength, strength parameters, determination of strength parameters from shear box test and triaxial test, soil dilatancy, concept of stress paths, peak and residual strength.
8. Ground investigation planning and steps; requirements and techniques

Intended Learning Outcomes: After completing this module, the students will be able to:

- Develop a basic knowledge and understanding of geological materials, their properties and distribution
- Evaluate potential geological problems in practical civil engineering situations
- Describe the main methods used to carry out in-situ ground investigation for both rock and soil deposits
- Distinguish between different soil types according to the British Soil Classification System
- Understand the importance of compaction on the engineering properties of a soil mass, identify various tests in a laboratory and in-situ to assess this and evaluate the optimum moisture content required to achieve best possible compaction levels
- Appreciate how permeability, seepage and consolidation can affect the mechanical behaviour of soils and construct flownets to investigate the rate of seepage flow
- Use the Mohr-Coulomb failure criterion, in conjunction with the Principle of Effective Stress to compute the shear strength of soils
- Apply the guidance given in testing standards such as BS1377 to investigate the engineering properties of soils

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes (EA1b)
- Knowledge of characteristics of particular materials, equipment, processes, or products (P2)
- Ability to apply relevant practical and laboratory skills (P3)

Assessment:
Assignment 1 (5%)
Assignment 2 (5%)
Online Class Test (10%)
Group Work - Project (30%)
Examination 1 (40%)
Online Class Test (10%)

Assessment Description: Geology Component – 30% of the 20 credit module:
Assignment 1 is a geology practical report dealing with minerals and rocks, to be submitted immediately after the practical session
Assignment 2 is a geology practical report dealing with geological maps, to be submitted immediately after the practical session
The online class test is an examination carried out on Canvas assessing the material covered in the geology portion of the module.

Soils Component – 70% of the 20 credit module:
The group work project is a report covering the soil mechanics practicals carried out in the geomechanics laboratory and the application of the parameters determined in the design of a simple structure.
Examination 1 is an end-of-module in-person assessment, covering all topics seen in the soil mechanics portion of the module

This module is assessed by a combination of examination and continual assessment. In order to pass the module students must achieve a minimum of 40% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Feedback on coursework to be provided electronically within 21 days of submission.
Feedback on the online class test may be via an office hours session
Examination 1 - Standard Faculty of Science and Engineering exam feedback form

Failure Redemption: Failure redemption is by supplementary examination in August.

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on campus.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

Available to visiting and exchange students.

EG-201 Fluid Mechanics II

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules: EG-160

Co-requisite Modules:

Lecturer(s): Dr J Li, Prof DE Reeve

Format: Lectures 2 hours per week for 10 weeks
Example classes 1 hour per week for 10 weeks
Laboratory work 2 hours for 1 week
Directed Private Study 3 hours per week
Contact Hours will be delivered through in-person activities and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

This module will contain lectures, worked examples, laboratory classes.
Assessement: 80% from end of teaching block examination; 20% from laboratory report work.

Additional notes:
As the University continues to respond to the developing Covid-19 pandemic module information may be subject to change to ensure students receive the best learning experience possible. We will make every effort to engage with students where changes are necessary and any changes will be communicated to students, as soon as possible. Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus

This module particularly builds on the work you have done in the Level 1 Fluid mechanics. You should revise the topics learnt in this module.

Module Aims: This module aims to create an interest in fluid flow, to show that flow phenomena are amenable to analysis, to show the relevance of fluid mechanics to Civil Engineering and to create confidence and ability in problem-solving in fluid mechanics.

Module Content: 1. Open-channel flow- Introduction to open-channel flow mechanics; Uniform flow; Rapidly-varied flow: Hydraulic jump, Sluice gate, Flow over weir; Gradually-varied flow: Derivation of the GVF equation, Flow profile classification, Numerical solution of the GVF equation.

2. Pipe flow- Pipe flow and energy line, Single pipeline analysis, Pipe network

3. Laminar and turbulent flow; drag force calculations. Vortices, Streamfunction and velocity potential. Linear water waves

Intended Learning Outcomes:
Technical Outcomes
On successful completion of this module, students should be able, at threshold level, to:
- Demonstrate a knowledge and understanding of : the concept of lift and drag; the energy line and pipe network; the classification of river flow and the concept of uniform and critical flow; the concept of backwater curves an hydraulic jump.
- Analyse and assess laboratory measured data and interpret results.
- Collate and present results and draw conclusions.
- Write reports.
- Appreciate errors and accuracy when taking measurements.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b)
- A comprehensive knowledge and understanding of mathematical and computational models relevant to the engineering discipline, and an appreciation of their limitation (SM5m)
- Understanding of the use of technical literature and other information sources (P4)
- Ability to work with technical uncertainty (P8)
- Understanding of appropriate codes of practice and industry standards (P6)
- Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities (G1)
- Plan self-learning and improve performance, as the foundation for lifelong learning/CPD (G2)
- Plan and carry out a personal programme of work, adjusting where appropriate (G3b)

Assessment:	Examination 1 (80%) Laboratory work (20%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description:
Laboratory work 20%. This involves proactive laboratory work and report writing. Attendance of the Fluids Laboratory component is compulsory.

Final year exam 80%. This is closed-book assessment examination.

Coursework is optional and is made of a weekly class test on canvas (Total 8 tests).

There is no resit for the laboratory component.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Model answers will be provided.
The laboratory report will be marked and feedback given.
Faculty feedback form will be completed and posted on the intranet.

Failure Redemption: A supplementary examination will form 80% of the module mark. There is no supplementary exam for the laboratory part of the module and therefore the laboratory mark obtained in the second semester will hold.

Reading List: Munson, Bruce Roy,, Young, Donald F., Okiishi, Theodore H., Fundamentals of fluid mechanics: SI units / Bruce Munson, Donald F. Young and Theodore H. Okiishi., Wiley,, 2009.ISBN: 9780470398814
Chadwick, A. J., Morfett, J. C., Borthwick, Martin,, Hydraulics in civil and environmental engineering / Andrew Chadwick, John Morfett and Martin Borthwick., CRC Press, Taylor & Francis Group,, 2013.ISBN: 9780415672450

Additional Notes: Available to visiting and exchange students.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment

Laboratory report work must be completed and handed in as specified by the lecturer.

This module has NO SUPPLEMENTARY for the Laboratory part.

In order to take this module you need to have taken Fluids Mechanics I and the Year 1 maths modules.

cessary and any changes will be communicated to students, as soon as possible. Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus

EG-219 Statistical Methods in Engineering

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Miss CM Barnes, Prof L Li, Prof P Rees, Dr Y Xuan

Format:
Lectures: 18 hours
Computer-based example classes: 16 hours
Directed private study 40 hours
Preparation for assessment 35 hours
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Series of lectures and computer practicals (face-to-face and online options available).

Module Aims: This module offers a balanced, streamlined one-semester introduction to Engineering Statistics that emphasizes the statistical tools most needed by practicing engineers. Using real engineering problems students see how statistics fits within the methods of engineering problem solving and learn how to apply statistical methodologies to their field of study. The module teaches students how to think like an engineer when analysing real data.

Mini projects, tailored to each engineering discipline, are intended to simulate problems that students will encounter professionally during their future careers. Emphasis is placed on the use of statistical software for tackling engineering problems that require the use of statistics.

Module Content:

Unit 1: Data Displays

• Lecture 1: Robust Data Displays. Engineering Method and Statistical Thinking (Variability); The Median; The Inter Quartile Range; Stem-and-Leaf displays; Boxplots.
• Lecture 2: Traditional Data Displays. The Mean; The Standard Deviation; Histograms; Chebyshev's Rule.

Unit 2: Modelling Random Behaviour

• Lecture 3: Probability. Rules of Probability; Independence; Total Probability; Bayes Rule; Reliability.
• Lecture 4: Discrete Random Variables. The Binomial Distribution; The Poisson Distribution; The Hyper geometric Distribution; Modelling Failure.
• Lecture 5: Continuous Random Variables. The Normal Distribution, The Exponential and Weibull Distributions; MLE; Sampling Distributions & The Central Limit Theorem.

Unit 3: Estimation and Testing

• Lecture 6: Non - Parametric Hypothesis Testing. The Null and Alternative Hypothesis; Significance Levels, The Sign Test; The Tukey Test.
• Lecture 7: Parametric Hypothesis Testing. Inference for a Single Mean; Inference for Two Independent Samples; Inference or Variances.

Unit 4: Model Building and Regression Analysis

• Lecture 8-9: Correlation & Simple Regression Analysis. The Correlation Coefficient, Simple Linear Regression, Non Linear Regression through Data transformations.
• Lecture 10-12: Multiple Regression and Diagnostics. Multiple Linear Regression, R2, Statistical Significance of Model Parameters; Residual Analysis.

Practical classes will complement each of the above lectures, where directed study will be provided to highlight how the techniques learnt in each lecture can be applied to typical engineering problems for each discipline.

Intended Learning Outcomes:

Technical Outcomes

Upon completion of this module the student should be able to:
- Appreciate the use and applicability of statistical analysis in engineering.
- Use statistical software to compute and visualise statistical functions.
- Build probabilistic models.
- Apply common statistic methodologies to their field of study.
- Apply statistical thinking and structured problem solving capabilities.
- Think about, understand and deal with variability.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b/SM2p)
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline (SM3b/SM3p)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3p)
- Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems (EA6m)

Assessment:	Project (50%) Examination (50%)

Assessment Description: Discipline Specific Mini Project (contributes 50% to module grade). Students will work on a mini project, related to their field of discipline, to perform statistical analysis and interpretation of a real-world data set using Matlab. The students will present their findings by submitting a written report.

Exam - Open Book (contributes 50% to module grade). Students will tackle a series statistical questions covering all topics.

Students need to achieve at least 30% in both components in order to pass the module.

If you do not meet the component level requirements for the module (i.e. achieving 30% in both components) you will receive a QF outcome. This means that you will be required to repeat the failed component(s), even if your module mark is above 40%.

Moderation approach to main assessment: Moderation by sampling of the cohort

Assessment Feedback: Students will receive their grades, together with models answers, within 3 weeks of submission.

Failure Redemption: Students will be required to redeem the component that they fail during the August supplementary period. Failure of both the project and examination will result in resitting both components.

Reading List: Hayter, Anthony J, Probability and statistics for engineers and scientists / Anthony Hayter., Brooks/Cole, Cengage Learning, 2012.ISBN: 1133112145
Ross, Sheldon M, Introduction to Probability and Statistics for Engineers and Scientists, Academic Press, 2020.ISBN: 0128243465
Ross, Sheldon M, Introduction to probability and statistics for engineers and scientists / Sheldon M. Ross., Academic Press, 2004.ISBN: 0125980574

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

Attendance at computer classes is compulsory.
The module is only for students within the the Faculty of Science and Engineering.
The module is unavailable to visiting/exchange students.
Notes, worked examples, assignments and mini projects can be found on Canvas.

Students need to achieve at least 30% in both components.

EG-221 Structural Mechanics 2

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules: EG-113; EG-115; EG-120; EG-166

Co-requisite Modules:

Lecturer(s): Prof O Hassan

Format: Lectures 22 hours
Tutorials / Example classes 11 hours
Directed private study 33 hours Preparation for assessment 34 hours

Delivery Method: Face to face

Module Aims: This module primarily concerns the analysis of statically indeterminate structures.

Module Content: • Determinate and Indeterminate Structures [1]
• Virtual work and the calculation of displacements - Definition of work, Principle of virtual work; Unit load theorem; Calculation of displacements in trusses and rigid jointed frames. [6]
• Analysis of simple statically indeterminate structures using virtual load method [4]
• Stiffness Method of 2D trusses[4]
• Stiffness Method of 2D frames[3]
• Influence Lines for statically determinate structures[2]
• Influence Lines for indeterminate structures[2]

Intended Learning Outcomes: Technical Outcomes
On successful completion of this module, students should be able, at threshold level, to:
- Demonstrate a knowledge and understanding of: the principles of equilibrium, compatibility and the influence of material behaviour. Virtual Work expressions and the Unit Load Theorem.
- Identify the forces applied by various supports.
- Distinguish between axial, bending, shear and torsional load carrying actions.
- Distinguish between statically determinate and indeterminate structures.
- Identify appropriate methods of analysis for trusses, beams and frames.
- Apply the equations of static equilibrium to calculate reactions, axial forces, bending moments, shear forces and torsional forces.
- Use the Unit Load Method for the calculation of displacements and rotations in structures. Analyse simple externally indeterminate 2-dimensional structures.
- Use a computer to check analyses of trusses, beams and frames.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies (SM1b)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2)
- Understanding of, and the ability to work in, different roles within an engineering team (P11)
- Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities (G1)
- Exercise initiative and personal responsibility, which may be as a team member or leader (G4)

Assessment: Examination 1 (80%)
Class Test 1 - Coursework (10%)
Class Test 2 - Coursework (10%)
Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: The final examination(2 hours) is OPEN BOOK (80% of the final mark).

The class tests(45min) are closed book tests

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Throughout the term, students will receive feedback in the form of marked assignments and discussion of tutorial examples.
Standard examination feedback form available for all students after the examination.

Failure Redemption: For the summer resit, the mark is purely based 100% on the supplementary exam. Note, the mark is capped at 40%.

Reading List: R. C. Hibbeler author., Structural analysis / R.C. Hibbeler ; SI conversion by Kai Beng Yap ; with additioanl SI contributions by Farid Abed., Harlow : Pearson Education Limited, 2020.ISBN: 9781292247236
Russell C. Hibbeler, Structural analysis, global edition / Russell C. Hibbeler., Pearson Education Limited, 2015.ISBN: 9781292089461
Hibbeler, Russell C., Structural Analysis / by Russell C. Hibbeler., Prentice Hall,, 2011.ISBN: 9789810687137

Additional Notes: The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

Available to visiting and exchange students. Students will be assessed in January by a 2hr written examination.

Additional notes:
This module particularly builds on the work you have done in the Level 1 Engineering Mechanics module and the Strength of Materials module. You should revise the topics learnt in these modules, particularly in the early part of this current module. This module also assumes that you are familiar with the basic mathematical concepts learnt in the Level 1 mathematics modules

EG-228 Problem Solving in Engineering with Matlab

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules: EG-201; EG-221

Lecturer(s): Prof R Sevilla

Format: Lectures and computer-based example classes – 2 hours/week
PC Lab – 2 hour/week
Preparation of homework, reports and tests – 2 hours/week
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

The module is delivered by lectures, using a mixture of power point presentations and whiteboard, and computer-based classes where the students will receive help to solve a proposed list of exercises.

A comprehensive set of notes will be are available for download via Canvas.

Further guidance will be given by providing a list of solved exercises and example Matlab programs.

Communication and course announcements, including office hours details, will be made via Canvas.

Course materials, including the course notes and links to relevant webpages, will be available for download from Canvas.

Module Aims: This module aims at:

• Consolidating the ability to use Matlab and to design computer programs for solving problems in engineering.
• Introducing the fundamentals of numerical methods to solve problems of engineering interest

Module Content: The module is structured in two parts.

Part I aims to review and further develop the ability and confidence of using Matlab as a numerical calculator. It involves:

• Introduction to Matlab.
• Introduction to programming 1: functions and scripts.
• Introduction to programming 2: control flow and loops.

Part II aims to introduce basic numerical methods that are commonly used to solve engineering related problems. It involves:
• Interpolation and approximation
• Numerical integration
• Root finding
• Numerical solution of ordinary differential equations.

Intended Learning Outcomes: Technical Outcomes
Upon completion of this module students should be able to:
• Modify an existing Matlab program to solve a variety of engineering problems.
• Design a Matlab program to solve engineering problems.
• Debug an existing program to find and fix existing syntax errors.
• Apply numerical methods for solving engineering problems that involve numerical integration, root finding, approximation and ordinary differential equations.

Accreditation Outcomes (AHEP)
SM1b Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
SM2b Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems
SM3m Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline and then apply them to analyse key engineering processes
SM4m Awareness of developing technologies related to own specialisation
SM5m A comprehensive knowledge and understanding of mathematical and computational models relevant to the engineering discipline, and an appreciation of their limitations
SM6m Understanding of concepts from a range of areas, including some outside engineering, and the ability to evaluate them critically and to apply them effectively in engineering projects.
EA1m Understanding of engineering principles and the ability to apply them to undertake critical analysis of key engineering processes
EA2 Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques
EA3b Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action
EA4 Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
EA6m Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems
D3b Work with information that may be incomplete or uncertain and quantify the effect of this on the design
P1 Understanding of contexts in which engineering knowledge can be applied (for example operations and management, application and development of technology, etc.)
P3 Ability to apply relevant practical and laboratory skills
P11b Understanding of, and the ability to work in, different roles within an engineering team
G1 Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities
G2 Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
G3b Plan and carry out a personal programme of work, adjusting where appropriate
G4 Exercise initiative and personal responsibility, which may be as a team member or leader

Assessment:	Coursework 1 (15%)
	Coursework 2 (25%)
	Exam - PC Laboratory (60%)
Resit Assessment:	Exam - PC Laboratory (100%)

Assessment Description: • Coursework 1 (15%) to assess Part I of the module.
This coursework is done in groups.

• Coursework 2 (25%) to assess Part II of the module.
This coursework is done in groups (same groups as in the first coursework).

• Individual Test (60%) to assess both Part I and Part II.
The test will be published in Canvas and students will have a limited time to complete it and submit the Matlab programs.

Moderation approach to main assessment: Not applicable

Assessment Feedback: Interaction, questions and answers are provided by the lecturer/demonstrators in the respective computing and practical laboratories and office hours.

The students will also benefit from the Mathematics and CAE Cafes.

The students will receive detailed feedback on their coursework.

Failure Redemption: A supplementary in-person PC Lab Examination will form 100% of the module mark.

In both PC lab exam in January and supplementary in August the students will have access to all the material in canvas (e.g. lecture notes, exercises, model answers).
Students will not be able to bring any extra material to the PC lab such as printed documents or books.

Reading List: Attaway, Stormy, author., MATLAB : a practical introduction to programming and problem solving, Butterworth-Heinemann, 2023.ISBN: 9780323917506
Hunt, Brian R., A Guide to MATLAB, 2014.ISBN: 9781107662223
Brian D. Hahn author., Daniel T. Valentine 1946- author., Essential MATLAB for engineers and scientists / Brian D. Hahn, Daniel T. Valentine., Amsterdam : Academic Press is an imprint of Elsevier, 2019.ISBN: 0081029985
Lindfield, G. R. (George R.), author., Penny, J. E. T. (John E. T.), author., Numerical methods : using MATLAB, Elsevier, 2019.ISBN: 9780128122563
Dukkipati, Rao V; ebrary, Inc, MATLAB an introduction with applications / Rao V. Dukkipati., New Age International (P) Ltd., 2010.ISBN: 9788122426984

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

The Faculty of Science and Engineering has a ZERO TOLERANCE penalty policy for late submission of all coursework and continuous assessment.

Lecture notes and homework for this module can be found on Canvas.

EG-233 Placement Preparation: Engineering Industrial Year

Credits: 0 Session: 2023/24 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Prof GTM Bunting, Dr SA Rolland, Dr V Samaras

Format: 11 hours consisting of a mix of seminars and workshops. 11 one hour drop-in advice sessions. Review of CV and cover letter.
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

This module is delivered through directed and self-directed learning, careers resources, interactive workshops, reflective learning practice and drop-in advice sessions. The module is delivered on the Bay Campus.

Module Aims: This generic cross-disciplinary module is for all students who have enrolled (or transferred) onto the Engineering Year in Industry scheme. The module focuses on the underpinning and fundamental requisites required to gain, enter and progress effectively through an industrial placement. Learners will be introduced to a) sourcing placements, CV writing and application techniques; (b) interview techniques - how to pitch yourself and be successful; (c) workplace fundamentals and IP awareness, behaviours and expectations; (d) key employability skills; getting the most from your Industrial Placement; and (e) health and safety in the workplace.

Module Content:
The module will focus on the key requirements to gain and be successful whilst on a placement. Directed and self-directed activity will address the following topics;

1) Engineering Industrial Placements - what they are, how to search and how to apply.
2) CV writing, cover letters and application processes.
3) Assessment centres, interview techniques and mock interviews.
4) Recognising and developing employability skills.
5) Reflecting and maximising the placement experience.
6) One to one meeting with careers and employability staff.
7) Health and safety in the workplace.

Intended Learning Outcomes:
Technical Outcomes
By the end of this module, students will:
- Know how to find and apply for placements, create a CV and complete a placement application.
- Understand the interview process and gain interview experience.
- Discuss and share what is expected within the workplace including behavioural and professional conduct.
- Identify personal employability skills and how these will be used in a workplace setting.

Accreditation Outcomes (AHEP)
EL5b Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues
EL6b Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk,

Assessment: Placements (100%)

Assessment Description:
Students are required to attend the health and safety lecture. Students who do not attend and have no valid reason will not be permitted to continue on an Engineering Industrial Placement Year programme of study.

Moderation approach to main assessment: Not applicable

Assessment Feedback:
N/A: students will however be able to discuss and seek feedback/advice on their search for an industrial placement, during the drop-in sessions.

Failure Redemption:
Successful completion of this module depends upon attendance at, and engagement with, the health and safety lecture. Therefore there will normally be no opportunity to redeem failure. However, special provision will be made for students with extenuating or special circumstances.

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

This module is only available for students enrolled on the Engineering Year in Industry scheme.

EG-234 Civil Engineering Management

Credits: 10 Session: 2023/24 September-January

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr CAC Wood, Miss X Yin

Format: Core Lectures: 20 hours
Assignments & Assessments: 12 hours
Private Study: 68 hours
It is hoped that the majority of contact hours will be face to face, involving lectures, seminars, practical sessions and academic mentoring sessions. Delivery may however be a blend of live online activities and on-campus sessions if necessary.

Delivery Method: Lectures will be delivered face to face on a weekly basis. Industry guest lectures will be delivered via Zoom. All assessments will be carried out in-person.

Module Aims: This module is based around the attributes (set out by the Institution of Civil Engineers) which are required to become an Incorporated or Chartered Civil Engineer. It will set out the framework of the construction industry and go some way to prepare students for what they are likely to face when they work in the civil, structural or building construction sector. It will give them an insight of the modern construction industry and the direction of travel of the industry. As well as the application of Civil Engineering and general engineering management, this module will develop knowledge and skills specific to Civil Engineering management, including (but not limited) risk management, sustainability and digital engineering.

Students will be introduced to the types of Civil Engineering projects and the project management processes required to build them. This part of the course will develop knowledge and understanding of considerations for Health and Safety, Sustainability, and Engineering Contracts for projects as well as how these are managed. It will particularly focus on the commercial / contractual management, and the different types of contracts in common use in the industry.

Students will also be encouraged to look at their own management style and the importance of good communication. They will develop their own CV's to gain an understanding of the aspects of professional behavior and development required by professional institutions.

The programme consists of lectures, industry-delivered talks, individual and groupwork assignments on the various aspects that will be encountered in Civil Engineering and the wider construction industry.

Module Content: 1. Introduction
2. Communication & Team Skills
 - Types of Communication
 - Team Management Skills
3. Management & Leadership
 - Leadership Skills
 - Introduction to Project Management
 - Planning and resource management
4. Commercial Ability
 - Cost and budgeting
 - Contract types
5. Health, Safety & Welfare
 - Health, Safety and Welfare
 - Introduction to risk management
 - Diversity and Inclusion
6. Sustainable Development
 - Sustainable development
 - UNSDG and their relation to future projects
7. Professional Commitment
 - Introduction to the ICE
 - Ethics
8. Careers Discussion
 - Unit on careers skills to be supported by the Centre for Academic Success (Mrs P Williams)

Intended Learning Outcomes: Technical Outcomes

After completing the module, students should have understanding of:

• Management, leadership and governance in the construction industry.
• A selection of typical engineering and construction processes used by organisations in the construction industry.
• How various management techniques and applications are applied on construction projects.
• The importance of health and safety within the construction industry, the issues related to health and safety and how it is managed on site within a construction project.
• How sustainability is considered and managed within a construction project.
• The different types of civil engineering contracts and how these are managed.
• The project management process and tools used in the industry.
• Personal development and human resources in construction.
• Professional development and the role if the professional institutions in the construction industry.

Accreditation Outcomes (AHEP)

- Awareness of developing technologies related to own specialisation (SM4m)
- Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct (EL1)
- Knowledge and understanding of the commercial, economic and social context of engineering processes (EL2)
- Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives (EL3)
- Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate (EL4)
- Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues (EL5)
- Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques (EL6b)
- Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (D1)
- Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards (D2)
- Plan and manage the design process, including cost drivers, and evaluate outcomes (D5)
- Knowledge of characteristics of particular materials, equipment, processes or products (P2b)
- Understanding of the key drivers for business success, including innovation, calculated commercial risks and customer satisfaction.(EL7m)
- Understanding of the use of technical literature and other information sources (P4)
- Knowledge of relevant legal and contractual issues (P5)
- Understanding of appropriate codes of practice and industry standards (P6)
- Awareness of quality issues and their application to continuous improvement (P7)
- Understanding of, and the ability to work in, different roles within an engineering team (P11)
- Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities (G1)
- Plan self-learning and improve performance, as the foundation for lifelong learning/CPD (G2)
- Exercise initiative and personal responsibility, which may be as a team member or leader (G4)

Assessment:	Assignment 1 (25%) Assignment 2 (25%) Assignment 3 (25%) Assignment 4 (25%)

Assessment Description: TBL 1 Week 4 (19/10/2022) – Management and Leadership (25%)
TBL 2 Week 6 (02/11/2022) – Commercial Ability (25%)
TBL 3 Week 8 (16/11/2022) – Health and Safety (25%)
TBL 4 Week 10 (30/11/2022) – Sustainable Development (25%)

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Students will receive feedback on all submitted work. For any Civil Engineering workshops components, students may receive feedback during the discussion sessions after they have completed the assessments. Feedback will be given via canvas on the assignments and assessments.

Failure Redemption: Repeat failed components.

Reading List: Chartered Institute of Building (Great Britain), Code of practice for project management for construction and development., The Chartered Institute of Building, John Wiley & Sons, Inc., 2014 - 2014.ISBN: 9781118378199
Institution of Civil Engineers (Great Britain), New civil engineer : NCE : magazine of the Institution of Civil Engineers., [T. Telford], 1972.ISBN: 03077683

Additional Notes: This module is assessed by a combination of individual and groupwork assignments delivered alongside the teaching (100% coursework).
Penalty for late submission of work: ZERO TOLERANCE.
The module is available to exchange students.

EG-235 Dynamics 1 (Med & Civil)

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr H Madinei

Format: Lectures & Example Classes 2 hours per week. Directed private study 3 hours per week Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

Classroom based teaching, CANVAS notes.

Module Aims: Elements of vibrating systems; simple harmonic motion; use of complex exponential representation. One-degree-of-freedom systems; natural frequency; effect of damping; harmonic excitation; transient dynamics; frequency domain analysis; impulse response function. Undamped mutli-degree-of-freedom systems; eigenvalues and eigenvectors.

Module Content: • Introduction to vibration and free response: Elements of vibrating systems, basic concepts, natural frequency, and simple harmonic motion.
• Free vibration of One-Degree-of-Freedom Systems: Application of Newton's second law to translating and rotating systems for the determination of differential equations of motion. Finding the natural frequency and considering the effect of damping in vibrating systems.
• Forced vibration of One-Degree-of-Freedom Systems: Considering different types of harmonic excitation.
• Transient response of One-Degree-of-Freedom Systems: Impulse response function and impact response.
• Free vibration of Multi-Degree-of-Freedom Systems: Natural frequency and mode shapes of a Two-Degree-of-Freedom Systems will be investigated.

Intended Learning Outcomes: • A knowledge and understanding of the importance of natural frequencies and resonance. The analysis of single and two degree of freedom systems.
• An ability to estimate resonances of simple systems.
• An ability to apply the methods presented in the course to develop simple models of real structures. Analyse these models to calculate natural frequencies and evaluate the response to harmonic forces.
• Study independently and use library resources.

SM1b Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies
SM2b Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems
SM3b Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
EA1b Understanding of engineering principles and the ability to apply them to analyse key engineering processes
EA2 Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques
EA3b Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action
EA4 Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems
P1 Understanding of contexts in which engineering knowledge can be applied (for example operations and management, application and development of technology, etc.)

Assessment: Examination 1 (80%)
Assignment 1 (20%)

Resit Assessment: Examination (Resit instrument) (100%)

Assessment Description: 20% from an online class test administered via CANVAS, and 80% from an in-person examination in May-June.

This module is assessed by a combination of examination and class test. In order to pass the module students must achieve a minimum of 40% in the examination component, and a minimum of 40% overall for the module. If students do not meet the exam and module requirements they will receive a QF outcome and will be required to take a supplementary assessment in this module, even if their module mark is above 40%.
If you pass the exam but have failed the class test, you may still fail the module, depending on the marks achieved, so it is important to complete the class test.
Resits are in the format of a supplementary exam.

Moderation approach to main assessment: Moderation of the entire cohort as Check or Audit

Assessment Feedback: Generic feedback on the online class test will be provided, following the test. The feedback for the final examination will be through the College module feedback procedure.

Failure Redemption: An opportunity to redeem failures will be available within the rules of the University. A supplementary exam will form 100% of the module mark.

Reading List: D. J. Inman author., Ramesh Chandra Singh contributor., Engineering vibration / Daniel J. Inman ; international editions contributions by Ramesh Chandra Singh., Harlow : Pearson Education Limited, 2014.ISBN: 9780273768449

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.

PENALTY: ZERO TOLERANCE FOR LATE SUBMISSION

Available to visiting and exchange students.

Additional notes:
- Office hours will be posted on CANVAS.
- Submission of the assignments will be via CANVAS ONLY. Email submissions will NOT be accepted.
- All notes and other teaching materials will be delivered via CANVAS ONLY.

EG-258 Civil Engineering Design and Practice 1

Credits: 30 Session: 2023/24 September-June

Pre-requisite Modules: EG-122; EG-125

Co-requisite Modules:

Lecturer(s): Dr CAC Wood, Miss X Yin

Format: Lectures (demonstrations) 2 hours per week
Example/Design classes 2 hours per week
Group work/Directed private study 10 hours per week
Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions and Academic Mentoring sessions.

Delivery Method: All Programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus

A real-life design project will be undertaken by students in groups. Through the project based learning the design theory and necessary skills for Steel and Reinforced Concrete detailed design will be revealed and put into practice. Weekly lectures and practical design classes will be held to help with the understanding of design methodologies and individual aspects of the project work. Where necessary individual group tutorial sessions can be organised in addition to the lectures and design classes. Students will continue their own familiarisation process with any software utilised e.g. Staad.Pro, Revit, AutoCAD

In addition to group project work submissions worth 70%, individual learning and engagement will supported through the use of Canvas quizzes and a January in-person examination worth 30%.

As part of the assessment, students will be required to give a presentation of their conceptual design to their instructors, peers and engineers from industry where appropriate.

All drawing and calculation group work will be evenly split between all members of the group. Staged submissions and group interviews will be used to moderate between group members if necessary.

Module Aims: A project based learning design module spanning TB1 and TB2. Learning is based upon real-world building design scenarios to develop Steel and Reinforced Concrete detailed design skills, whilst also aiming to provide students with understanding of the whole building design process and real-life design experience. Stages of group work project include: 1. Concept development 2. Preliminary design 3. Health and Safety CDM Risk Assessment and Ethics 4. Detailed design in steel and reinforced concrete and 5. Sustainability

Module Content: TB1:
Structural design principles:
Eurocode philosophy: limit states.
Eurocode design principles: actions/actions on structures/wind loading
Eurocode design principles: load combinations.
Basics on simple analysis methods for continuous beams and moment redistribution methods/analysis of structures
Sustainability concepts.

Steel Design:
Design of steel members in axial tension and compression.
Design of fully laterally restrained steel beams and laterally unrestrained steel beams
Design of steel columns for axial load plus bending.
Design of bolted/welded steel connections, steel column base plate

Reinforced Concrete Design:
Design of reinforced concrete beams and slabs
Simple reinforced concrete column design

TB2:
A comprehensive group design project, which includes both reinforced concrete and steel design based upon a real-world scenario. Students will be required to work through the full design process from conceptual to detailed design, carrying out risk assessment for health and safety, paying due consideration to sustainability of the project where appropriate.

By the end of this project, each group will have produced a conceptual design poster, a full portfolio of complete design calculations, engineering drawings, designer's risk assessment, a discussion of how a design engineer should deal with an ethical dilemma, and an outline of how the whole-life sustainability of building has been considered in the structural design.

Intended Learning Outcomes: Technical Outcomes
By the end of this module, you should:

Develop knowledge and understanding of:
• Development of a building concept from scratch to meet a client brief/tender document, including appraisal in the context of sustainability (BREEAM).
• Design considerations for the detailed design of steelwork, reinforced concrete and the detailed design process of civil engineering projects as a whole.
• The various steps of the building design process and parties involved.
• The 'anatomy' of the structural form of a building.
• Principles of building in CDM.
• Ethical dilemmas which may occur during the design process.

Develop ability to:
• Visualise, through hand sketching and physical modelling of the structural form to identify possible design solutions/problems.
• Disassemble a structure for element design.
• Make planning and design decisions as a group.
• Carry out designers' risk assessment following Health & Safety Executive guidelines.
• Apply knowledge of appropriate steel and reinforced concrete materials selection, design techniques, processes for the appraisal of build options in the context of the sustainability to an individual, real-life project.
• Consider the "whole-life" construction, including life-cycle assessment, environmental, energy, economic, social factors.
• Make use of and apply critical scrutiny to computer software output.
• Communicate planning and design decisions by production of formal drawings using AutoCAD.

Develop skills in:
• Working as a member of a team including division of work, checking of group-members' work and working to deadlines.
• Time management of both individual and group work. Delivering to project deadlines.
• Communication of design ideas and basis of design calculations using hand sketches.

Accreditation Outcomes (AHEP)
- Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems (SM2b)
- Understanding of engineering principles and the ability to apply them to analyse key engineering processes EA2 Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA1b)
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques (EA2)
- Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action (EA3b)
- Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems D1 Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (EA4)
- Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics (D1)
- Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards (D2)
- Work with information that may be incomplete or uncertain and quantify the effect of this on the design (D3)
- Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal (D4)
- Communicate their work to technical and non-technical audiences (D6)

- Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct (EL1)
- Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate (EL4)
- Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques (EL6)
- Knowledge of characteristics of particular materials, equipment, processes or products (P2b)
- Understanding of appropriate codes of practice and industry standards (P6)
- Understanding of, and the ability to work in, different roles within an engineering team (P11)
- Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities (G1)
- Exercise initiative and personal responsibility, which may be as a team member or leader (G4)

Assessment:	Group Work - Project (15%) Group Work - Project (10%) Group Work - Project (10%) Group Work - Project (30%) Group Work - Project (5%) Examination (30%)
Resit Assessment:	Examination (Resit instrument) (100%)

Assessment Description: TB1: In-person examination on steel and concrete design theory and methods worth 30%.

TB2: Design Practice Project: 70% of 30 credit module, with the following assessment elements:
Group Work 1 – Conceptual design - 15% of 30 credit module
Group Work 2 – Design development - 10% of 30 credit module
Group Work 3 – CDM Risk assessment and Ethics considerations in design - 10% of 30 credit module
Group Work 4 – Detailed design - 30% of 30 credit module
Group Work 5 – Sustainability - 5% of 30 credit module

Note: The TB2 Design Practice Project (worth 70%) must be passed in order to pass this module.

Moderation approach to main assessment: Moderation by sampling of the cohort

Assessment Feedback: Student groups will receive detailed oral feedback throughout the projects during weekly scheduled design classes. If deemed necessary, some groups may also be invited to a formal group interview at the end of each project, so that a fair distribution of marks may be awarded within the group.

Failure Redemption: If an individual fails to pass the TB2 Design Practice Project or the module overall then the failure may be redeemed in an August supplementary examination.

Additional Notes: Delivery of both teaching and assessment will be blended including live and self-directed activities online and on-campus.
Project work will have phased submissions for marking to ensure satisfactory progress by each member of the group. Groups may be interviewed after each stage submission.
Practical work time will be intermixed with lecture hours and weekly scheduled group tutorials.
Notes from relevant design guides / Eurocodes / details on case studies of good practice will be made available to students by the lecturer involved via Canvas / during lectures.
Where possible learning will be reinforced by guest lectures from practicing civil engineers and site visits.
Students are also recommended to attend relevant ICE and IStructE evening lectures.

EG-277 Research Project Preparation

Credits: 0 Session: 2023/24 September-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr AC Tappenden, Dr M Fazeli, Mrs KM Thomas

Format: Formal Lectures - 2-3 hours

Delivery Method: 2-3 formal lectures throughout the academic year concerning project design and selection.

Module Aims:

This module has been designed to provide you with information needed ahead of undertaking a research project in Year 3 of studies.

The research project in Year 3 is worth 30 credits, and will involve the application of scientific and engineering principles to the solution of a practical problem associated with engineering systems and processes.

In the research project you will gain experience in working independently on a substantial, individually assigned task, using accepted planning procedures. It will require and develop self-organisation and the critical evaluation of options and results, as well as developing technical knowledge in the chosen topic.

The preparation for the research project commences in Year 2 where you are required to engage in project selection. In this preparation module we will confirm the options available to you to either define your own project or to select from a list of project titles and descriptors put forward by academic staff. Communications concerned project selection will be done via the Canvas course page. Additional supplementary resources will also be provided.

Module Content: In conjunction the formal lectures and supplementary resources will cover:

- Key staff members - contact details
- Key dates for Year 2 regarding project selection - defining your own project or selecting from staff titles
- How to design a project concept and what to consider before approaching a possible supervisor
- Where to start in finding a possible supervisor
- What to do if you're hoping to undertake a placement year
- Selecting from staff titles
- Further information around the allocation process
- First steps in EG-353 when you commence Year 3

Intended Learning Outcomes: NA

Assessment: Participation Exercise (100%)

Assessment Description: This module is not assessed but we would strongly suggest participation to ensure that you understand how the project selection system will work.

Moderation approach to main assessment: Not applicable

Assessment Feedback: NA

Failure Redemption: NA

Additional Notes: Only available to students following an Engineering Degree Programme.

EG-295 Introduction to Transportation Engineering

Credits: 10 Session: 2023/24 January-June

Pre-requisite Modules:

Co-requisite Modules:

Lecturer(s): Dr Y Hou

Format: Lectures/Workshops: classes: 30h. Contact Hours will be delivered through a blend of live activities online and on-campus, and may include, for example, lectures, seminars, practical sessions, and Academic Mentoring sessions.

Delivery Method: All programmes will employ a blended approach to delivery using the Canvas Digital Learning Platform for live and
self-directed online activity, with live and self-directed on-campus activities each week. Students may also have the opportunity to engage with online versions of sessions delivered on-campus.

The module will be delivered by means of lectures, workshops and guest lectures: 30 h in total

Module Aims: Transportation engineering plays the fundamental role for the operation of society. This module will deliver basic knowledge, basic governing equations, and computation skills in transportation engineering. Typical transportation modes, including road transportation and railway transportation, will be introduced in detail. The whole life cycle of road and railways, from design, construction, operation, to maintenance will also be introduced.

Module Content: History and content of transportation engineering
Climate emergency in transportation and sustainable approaches
Optimal road material design under extreme service conditions and severe environmental conditions
Optimal railway design under extreme service conditions and severe environmental conditions
Optimal design in UK and in the rest of the world
Flexible road distress recognition and repair;
Rigid road distress recognition and repair
Railway design
Road distress recognition and repair
High-speed railway

Intended Learning Outcomes: Analyse broadly-defined problems reaching substantiated conclusions

Apply a systematic approach to the solution of broadly-defined problems

Identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity

Select and apply appropriate materials, equipment, engineering technologies and processes

Recognise the need for quality management systems and continuous improvement in the context of broadly-defined problems

Apply knowledge of engineering management principles, commercial context and project management

Assessment: Assignment 1 (10%)
Assignment 2 (10%)
Project (10%)
Examination (70%)

Resit Assessment: Coursework reassessment instrument (100%)

Assessment Description: 1. Assignment 1: homework on asphalt properties (10%)
2. Assignment 2: homework on traffic calculation (10%)
3. Project essay: essay on maintenance approach and methods on distresses on transportation infrastructures (10%)
4. Final exam: closed book exam (70%)

Moderation approach to main assessment: Partial moderation

Assessment Feedback: Assignments 1 & 2: Submitted via Canvas. Feedback provided via Canvas. Office hours will be held to provide further verbal feedback.

Project essay: Submitted via Canvas. Feedback provided via Canvas. Office hours will be held to provide further verbal feedback.

Final exam: Individual student feedback will be provided through Canvas or email. Marked/Commented freehand drawings will be returned to students for feedback.

Failure Redemption: Student eligible to redeem failure in Summer will be given a single piece of supplementary coursework worth 100% of the marks for this module.

Additional Notes: As the University continues to respond to the developing Covid-19 pandemic module information may be subject to
change to ensure students receive the best learning experience possible. We will make every effort to engage with students where changes are necessary and any changes will be communicated to students, as soon as possible. Delivery of both teaching and assessment will be blended including live and self-directed activities online and on- campus.

Penalty for late submission of continuous assessment assignments: zero tolerance - no marks awarded for late submissions.

Available to visiting and exchange students.